GUIDELINE A-9

NOx Emissions from Boilers and Heaters

Legislative Authority:
Environmental Protection Act, Sections 6, 9, and 14
Ontario Regulation 346

Responsible Director:
Director, Environmental Partnerships Branch

Last Revision Date:

March, 2001

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SYNOPSIS

The purpose of this Policy Guideline is to reduce smog in Ontario, by reducing the emission of oxides of nitrogen by new (or modified), large, boilers and heaters.

This Policy Guideline adopts the National Emission Guideline for Commercial/Industrial Boilers and Heaters, approved by the Canadian Council of Ministers of the Environment in March, 1998 ("the CCME Guideline").

A copy of the CCME Guideline is attached to this document.

The Guideline specifies limits for emissions of oxides of nitrogen ("NOx") for new or modified fossil-fuel boilers and heaters which have a fuel energy input greater than 10 million Btu/h (10.5 GJ/h). The Guideline specifies various NOx emission limits, based on the type of fuel and the size of boiler or heater, with specified credits for high efficiency. The NOx emission limits are specified in grams of NOx per gigajoule of fuel energy consumed. These emission limits do not apply to coal-fired or wood-fired boilers, and heaters, or to certain industrial boilers and heaters, which are listed in the CCME Guideline.

The CCME Guideline also contains recommendations for non-regulatory activities, to reduce NOx emissions by older or smaller boilers and heaters.

This Policy Guideline indicates how the Ministry will interpret and apply the CCME Guideline.

1.0 INTRODUCTION

Smog is a serious air pollution problem in Ontario and other parts of Canada. One of the contributors to smog is the emission of oxides of nitrogen ("NOX") by boilers and heaters. In May, 1991, the Canadian Council of Ministers of the Environment ("CCME") issued Phase 1 of a Management Plan for Nitrogen Oxides and other smog precursors, in response to the smog problem in many parts of Canada. Initiative N306 of this Plan called for the development of a National Emission Guideline, defining NOx emission limits for new or modified, large boilers and heaters. The National Emission Guideline was published by the CCME in 1998, and approved by Canada, by Ontario, and by and the other provinces and territories. The application of this CCME Guideline in Ontario and in other parts of Canada will reduce smog.

The Ontario Ministry of the Environment has adopted the National Emission Guideline for Commercial/Industrial Boilers and Heaters, approved by the Canadian Council of Ministers of the Environment in March, 1998, as MOE Policy Guideline A-9. This document defines the implementation

and application of the Ontario Policy Guideline.

The Ministry of the Environment of Ontario has developed a balanced approach to air emissions issues which includes regulatory and non-regulatory measures. This Policy Guideline specifies emission limits for large, new boilers and heaters, but it also directs owners and operators of boilers and heaters to voluntary activities which can reduce air emissions while increasing efficiency and reducing operating costs. The CCME Guideline has already been adopted by several large industry associations in Ontario, including the Canadian Steel Producers Association and the Canadian Petroleum Products Institute.

2.0 IMPLEMENTATION AND APPLICATION IN ONTARIO OF THE CCME GUIDELINE

Application of Policy Guideline

Emissions Limits - NOx

The CCME Guideline establishes limits for the emission of oxides of nitrogen ("NOx") from specific boilers and heaters. Ministry of the Environment ("MOE") Policy Guideline A-9 adopts these emission limits and directs that they be considered by a Director in determining whether or not to issue a Certificate of Approval for any new or newly-modified Ontario boiler or heater which burns oil or gas fuel and is larger than 10.5 GJ/h (10 million Btu/h) (fuel energy input). (There are exceptions to the requirement that a Certificate of Approval be obtained. These are set out below.)

The statutory requirements for the approval of any equipment or process which may discharge to the air are contained in Section 9 of the Environmental Protection Act ("EPA"). Section 9(1) requires that approval be obtained from the Director before establishing new or modifying existing equipment or processes which may discharge a contaminant to the air. For the adoption of the CCME Guideline in Ontario, a "modified" boiler or heater is one that has been altered in such a way that it triggers the approval requirements of Section 9(1) of the Ontario Environmental Protection Act.

Accordingly, the owner of any new or newly-modified Ontario boiler or heater (commercial, industrial, or residential) which burns oil or gas fuel and is larger than 10.5 GJ/h (10 million Btu/h) (fuel energy input) shall obtain a Certificate of Approval ("CofA") from the Ministry before operating the boiler or heater. Under this Policy Guideline, in order to obtain a CofA, the owner must satisfy the Director that the new or modified boiler or heater will emit oxides of nitrogen ("NOx") within the limits specified in the CCME Guideline (see below).

The owner must present to the Ministry a statement signed by an Professional Engineer, registered in the Province of Ontario, verifying that the new or modified boiler or heater will emit NOx within the specified

limits. Please note that a Professional Engineer is defined as a Professional Engineer within the meaning of the *Professional Engineers Act*.

The emission limits and acceptable methods of demonstrating compliance with the emission limits are described below, in **Information for Professional Engineers and Industry Professionals**.

Exceptions

Certificates of Approval for the following equipment will not be governed by the limits and procedures set out in Policy Guideline A-9:

- coal-fired boilers and heaters
- wood-fired boilers and heaters
- pyrolysis heaters *(Petrochemical Sector)*
- steam reformer heaters *(Refining Sector)*
- steam cracking heaters *(Refining Sector)*
- coke ovens *(Steel Sector)*
- blast furnace stoves *(Steel Sector)*
- reheat furnaces *(Steel Sector)*
- by-product fuel boilers and heaters *(Multiple Sectors)*
- chemical recovery boilers *(Pulp and Paper Sector)*

Policy Guideline A-9 applies only to boilers and heaters which are fired with a primary fuel. Policy Guideline A-9 does not apply to boilers and heaters which are fired with a standby fuel (less than 500 hours per year).

Requirement for Record Keeping

If granted a Certificate of Approval for the boiler or heater, the owner shall maintain the Certificate of Approval and all supporting documents at the site where the boiler or heater is located, until the boiler or heater ceases operation.

Voluntary Activities

The CCME Guideline also mentions voluntary activities in support of energy efficiency and reduced emissions from boilers and heaters. These voluntary activities include inspection and maintenance of boilers and heaters. These voluntary activities are not mandatory in Ontario at this time. However, the Ministry strongly recommends that owners of combustion equipment pursue these activities to reduce operating costs and air emissions. For information and assistance in these voluntary activities, contact the Environmental Partnerships Branch of this Ministry at the following coordinates:

Ministry of the Environment
Environmental Partnerships Branch
40 St. Clair Ave. W., 14th Floor
Toronto, ON M4V 1M2

Tel: (416)327-1443
Fax: (416)314-7919
E-Mail: markowto@ene.gov.on.ca

Information for Professional Engineers and Industry Professionals

Emission Limits and Calculation Procedures

Emissions of NOx as nitrogen dioxide, in units of grams NOx per gigajoule of input fuel energy, from new or modified Ontario boilers and heaters, according to primary fuel, shall not exceed the following:

Capacity	NOx Emission Limit			
	Gaseous Fuel	Distillate Oil	Residual Oil <0.35% Nitrogen	Residual Oil • 0.35% Nitrogen
10.5 - 105 GJ/h (10 - 100 MMBtu/h)	26 g/GJ	40 g/GJ	90 g/GJ	110 g/GJ
>105 GJ/h (>100 MMBtu/h)	40 g/GJ	50 g/GJ	90 g/GJ	125 g/GJ

Below is the same table of NOx Emission Limits, expressed in ppm NOx by volume (as NO_2) in the flue gas, at 3% O_2 in the flue gas, dry basis.

Capacity	NOx Emission Limit			
	Gaseous Fuel	Distillate Oil	Residual Oil <0.35% Nitrogen	Residual Oil • 0.35% Nitrogen
10.5 - 105 GJ/h (10 - 100 MMBtu/h)	49.6 ppm	72.3 ppm	162.7 ppm	198.9 ppm
>105 GJ/h (>100 MMBtu/h)	76.3 ppm	90.4 ppm	162.7 ppm	226.0 ppm

If the O_2 concentration in the flue gas is not 3% at time of measurement, the measured ppm NOx can be converted to equivalent ppm NOx at 3% O_2 by using the following equation:

(ppm NOx at 3% O_2) = (ppm NOx at measured % O_2) x 17.9 ÷ (20.9 - measured %O_2)

Sample Calculation:
The instrument measures 85.3 ppm NOx and 4.5% O_2 in the flue gas, dry basis.
What is the equivalent ppm NOx, at 3% O_2 ?
Answer:

(ppm NOx at 3% O_2) = (ppm NOx at measured % O_2) x 17.9 ÷ (20.9 - measured %O_2)
= (85.3) x 17.9 ÷ (20.9 - 4.5)
= 93.1

The equivalent at 3% O_2, dry basis, is 93.1 ppm NOx.

Acceptable Proof of Compliance with NOx Emission Limits

Compliance with the NOx emission limits specified in Policy Guideline A-9, as required to support an application for a CofA under section 9 of the EPA, may be demonstrated using any of the following three methods:

(1) "Packaged" boilers and heaters already certified as low-NOx by reputable certification agencies in Canada and elsewhere will be deemed to have demonstrated compliance with Policy Guideline A-9 for the purposes of issuance of a CofA, if their certified NOx emissions meet the limits specified in Policy Guideline A-9.

(A "packaged" boiler or heater has the burner, the heat exchanger, the controls, the refractory, the gas supply, the exhaust, the water supply, the electrical connections etc. built together in one pre-engineered, manufactured unit.)

(Please note that some packaged boilers and heaters are certified as low NOx to published standards of USEPA NSPS, American Gas Association, California Air Resources Board, South Coast Air Quality Management District, etc.)

(2) In the absence of certification as described above, compliance with Policy Guideline A-9 for the purpose of supporting an application for a C of A can be demonstrated by the Applicant if the Applicant provides sufficient supporting information showing that an identical boiler or heater, operating in another location, in a situation identical to the applicant's, has been tested by an independent, reputable agency, using an acceptable test method, and proven in the previous location to meet the NOx emission limits specified by Policy Guideline A-9.

Acceptable test methods include Environment Canada Test Reference Method EPS1/RM/15, CAN/CSA

Z223.2-M86, USDOE NSPS Test Method 7E, and SCAQMD Method 100.1.

(3) New, unique equipment which has not been tested or certified previously will be deemed to have demonstrated compliance with Policy Guideline A-9 for the purposes of supporting an application for a CofA if the Applicant provides sufficient supporting information showing that the equipment's NOx emission rate will be within the limits specified by Policy Guideline A-9.

Variable Firing Rates

The Applicant for a CofA for a new or modified boiler/heater with a variable firing rate shall satisfy the Ministry that the new or modified boiler/heater will meet this Policy Guideline's NOx emission limits at full-fire, at minimum firing rate, and at the mid point between full-fire and minimum firing.

Energy Efficiency Credits

Certain high-efficiency equipment is eligible for an efficiency credit, allowing for a higher allowable NOx emission rate.

Similarly, equipment which gains efficiency through heat recovery from exhaust gases is also eligible for an efficiency credit.

If the applicant chooses to apply for energy efficiency credits, the applicant shall provide to the Ministry the necessary calculations and documents.

For details, please see pages 6-8 of the 1998 CCME National Emission Guideline for Commercial/Industrial Boilers and Heaters.

Carbon Monoxide Emissions

This Policy Guideline is not intended to regulate emissions of carbon monoxide ("CO"). O.Regulation 346 under the Environmental Protection Act regulates CO emissions. In Ontario, the Technical Standards and Safety Authority regulates stack emissions of CO.

Emissions Trading

The CCME Guideline refers to NOx emission trading as an alternative approach to reducing NOx emissions. For information about NOx emission trading, please contact MOE Air Policy and Climate Change Branch, at 416-314-6789.

3.0 FOR FURTHER INFORMATION

Please contact any District or Regional Office of the Ministry of the Environment, or

Environmental Assessment and Approvals Branch

2 St. Clair Avenue West, 14th Floor
Toronto, ON M4V 1L5
Tel: 1-800-461-6290
Fax: (416)314-7030

For an application for a Certificate of Approval, please contact the Environmental Assessment and Approvals Branch at the above location.

If you want to purchase a copy of the CCME Guideline, please contact the CCME at:

Canadian Council of Ministers of the Environment
c/o Manitoba Statuatory Publications
200 Vaughan St.
Winnipeg, MB R3C 1T5

Tel: (204)945-4664
Fax: (204)945-7172
e-mail: spccme@che.gov.mb.ca

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